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ABSTRACT

In 1982, the Maryland State Department of Education initiated a longitudinal study of its Extended Elementary Education prekindergarten program. The study was designed to examine the school performances of program participants and members of a comparable nonpreschool group. At the time of this analysis, study participants were 16 years of age. Major questions addressed by the study were: (1) What effect does prekindergarten have on participants' school behavior in comparison to school behavior of members of the nonpreschool group? (2) Does prekindergarten participation improve economically disadvantaged children's performance to the extent that they achieve at a level comparable to that of children from a variety of socioeconomic backgrounds? (3) If prekindergarten leads to higher achievement, are the differential effects sustained over time? and (4) Does the achievement gap between the prekindergarten and nonpreschool groups widen as they progress through school? In this phase of the study, the effects of prekindergarten were traced from kindergarten though ninth grade. The findings show that prekindergarten participation sets in motion a linear path of effects that leads to improved academic performance through the beginning of high school. Citations number 32. (RH)

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AN ANALYSIS OF THE LONG-TERM EFFECTS OF THE EXTENDED ELEMENTARY EDUCATION PREKINDERGARTEN PROGRAM

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Language Development and Early Learning Branch
Division of Instruction
Maryland State Department of Education
and
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INTRODUCTION

Within the last five years, states have shown an increased interest in early education. Nowhere is this more evident than in the political and financial investments they have made in preschool programs, particularly for children living in poverty. Since 1986, more than 20 states have passed legislation mandating or encouraging preschool education in the public schools. In spite of shrinking tax dollars, nineteen states have initiated, maintained, or expanded their own early childhood programs. By 1989, 33 states were spending about one third of a billion dollars for that purpose. (Mitchell, Seligson, and Marx, 1989).

What accounts for the renewed public commitment to preschool funding? It may be that a plethora of research on the short-term effects of early intervention for low-income children overwhelmingly shows that it improves intellectual functioning and academic performance in the first few years of school (McKey, et al., 1985; Schweinhart and Weikart, 1986). Or it may be that cost-benefit analyses have convincingly demonstrated that investments in early education yield high returns, in some cases nearly six times the initial cost of a one-year program (Weber, Foster, and Weikart, 1978; Berruetta-Clement, et al., 1984).

One of the most probable reasons is the growing concern over America's political and economic future. Currently, one out of every four students in the United States fails to graduate from high school. The greatest proportion of drop-outs are poor, minority, and/or limited in English proficiency (Hornbeck, 1986). For these students, academic difficulties were frequently evident as early as third grade (Schorr and Schorr, 1988). Many legislators and social policymakers are counting on early education to redirect the course of school failure on which economically disadvantaged children are set early in life. They are hoping that the causal model of positive preschool effects that links short-, mid-, and long-term benefits will play out, resulting in a significantly larger percentage of at-risk children finishing school and becoming responsible, self-sufficient adults.

In spite of the hopes, the evidence is not unequivocal in showing that early education can contribute to success in school and later life. Featherstone (1986), Schweinhart and Weikart (1980), and the Consortium for Longitudinal studies (1983) all maintain that one of preschool's most significant effects is in helping children meet their school's expectations and avoid being labeled as failures. Children with early education apparently repeat fewer grades and are placed in special education less often than their non-preschool peers. For example, the New York State Department of Education's evaluation of over 6,000 children who participated in an experimental prekindergarten program revealed that significantly fewer (8 percent) preschool participants than non-preschool children repeated a grade or spent time in special education. Darlington and Lazar's meta-analysis of a number of experimental preschool intervention programs that operated in the early and mid 1960s found similar effects. Across all programs, 44 percent of the children without preschool education repeated a grade or were assigned to special education; for preschool graduates the figure was only 25 percent.

When findings from the studies involved in Darlington and Lazar's meta-analysis are examined separately, a different picture emerges. Using placement in special education as the outcome measure, only three of six programs demonstrated statistically significant differences between the non-preschool and early intervention groups. Two of the three programs that significantly reduced assignment to special education were home-, not center-based. Using retention as the outcome measure, only one program--the center-based Harlem Training Project--significantly reduced grade level failures.

Only a modest number of studies have been conducted on preschool's mid-term achievement effects; fewer, still, have examined its long-term impact (Schweinhart and Weikart, 1986). Among studies investigating the longer term effects of early education, most report that initial achievement gains wash-out and disappear around third or fourth grade (Gray and Klaus, 1970; Smith and James, 1975; Irvine and Flint, et al., 1982). However, a longitudinal study of preschool education in Cincinnati, Ohio found significant differences in mathematics and reading achievement at eighth grade as measured by the Metropolitan Achievement Test (Nieman and Gastright, 1981). A study of the Perry Preschool Project revealed that, at age 14, the achievement test scores of preschool children were, on the average, 1.2 grade equivalent units higher than those of non-preschoolers. Results from reading, mathematics, and language achievement subtests followed a similar pattern and increased in magnitude of effect from first grade onward.

In 1974, the Educational Research Service, a research organization established and sponsored by the Council of Chief State School Officers and National Association of Elementary School Principals, among other education organizations, reviewed more than 40 studies on the impact of early education. One of its primary conclusions was that the findings are mixed in regard to preschool's effectiveness in raising economically disadvantaged children's performance to "middle class" norms. More recent findings support that conclusion.

Preliminary results from an assessment of Philadelphia's Prekindergarten Head Start found the program to be effective in raising the educational attainment of low-income children to a level comparable to the district's norms on standardized tests administered through grade three (Philadelphia School District, Office of Research and Evaluation, 1982). Similar effects were noted through grade five for Chicago's Parent-Child Centers, but only for center graduates who were kept in intact classes through the elementary grades (Institute for the Development of Educational Auditing, 1974). Hebbeler, (1985) found that although Head Start improved the performance of low-income children, when their performance was compared to that of higher income students, achievement discrepancies persisted through elementary school and beyond. Early intervention did not improve educationally disadvantaged children's achievement to the extent that they could compete on an equal footing with *any* peer group.

Findings from research indicate that different preschool programs have different effects on children. High quality programs can have a positive impact on the later school performance of low-income children but they don't always. It is thus nieve to believe that the benefits of early education are guaranteed solely by its provision. Many of the preschool programs that resulted in positive educational outcomes were model demonstration projects with human and material resources far beyond those typically available to programs operated on a much wider scale. In addition, many were specifically developed with research purposes in mind. They were rigorously planned, very carefully implemented, and stringently supervised (Darlington, 1983). This may be more than can be expected of more typical field programs that are constrained by the conditions of everyday school practice.

There are few longitudinal evaluations of state-funded prekindergarten programs. The New York State Department of Education reported mixed mid-term effects for its experimental prekindergartens. The South Carolina State Department of Education began following its program participants in 1987. Initial findings indicate that prekindergarten increased children's readiness for first grade, if a level of program quality was maintained.

Given the limited research available on the long-term effects of state-funded prekindergarten education, in 1982, the Maryland State Department of Education (MSDE) initiated a longitudinal study of its Extended Elementary Education prekindergarten program (EEEP). The quasi-experimental study examines the on-going school performance of program participants and a comparable non-preschool group. Study participants are now 16 years old. The major questions the study address are:

1. In comparison to a similar group with no known preschool experience, what effect does prekindergarten have on participants' school performance?

2. Does prekindergarten participation improve economically disadvantaged children's performance to the extent that they achieve at a level comparable to that of children from a variety of socioeconomic backgrounds?

3. If prekindergarten leads to higher achievement, are the differential effects sustained over time? Does the achievement gap between the prekindergarten and non-preschool groups widen as they progress through school?

PREKINDERGARTEN PROGRAM BACKGROUND

The Maryland State Department of Education provides limited funds to public school systems to operate prekindergarten as part of the Extended Elementary Education Program. The impetus for the development of the EEEP program came from former State Superintendent David W. Hornbeck who was concerned about the lack of publicly funded preschool opportunities for Maryland's neediest children. As a result of expressing his concern to the State Board of Education, Resolution No. 1978-17 was passed. It directed MSDE to develop a program to extend elementary education to four-year-olds with a high potential for school failure. The resolution also called for coordination in each school system between prekindergarten and existing programs for kindergarten and the early elementary grades.

EEEP encompasses prekindergarten through grade three. Its overall goal is to provide quality experiences that will help children develop and use the basic competencies necessary for success in the middle and later learning years and beyond. Guidelines for the implementation of the prekindergarten program are loosely structured at the state level to allow for local adaptation based on local school system philosophies and the needs of children being served by each school. The state guidelines to which each local school system receiving program funds must conform have remained the same since the program's initial inception. As currently outlined in *Standards for Implementing Quality Prekindergarten Education* (Maryland State Department of Education, 1987) they include:

Prekindergarten Education

- Two daily sessions that operate a minimum of 2-1/2 hours each
- A ratio of 20 children to two adults, one of whom is a state-certified early childhood education teacher and the other of whom is a full-time assistant
- A curricular focus on all aspects of development
- A balance in learning through small group teacher-facilitated experiences and child-initiated activities. Reliance on an open-framework approach to program implementation.
- Ongoing assessment of each child's growth and development primarily through observation

Continuity of Learning

- Cross-grade staff communication and cooperation to ensure continuity of learning beyond prekindergarten
- Careful attention to initial placement when children move from one grade level to the next
- Careful attention to within-grade pacing to accommodate to individual strengths and needs

Home-School Cooperation

- Daily opportunities for parents to participate in the school-based program
- Parental involvement in extending learning outside of school

Program Staff

- Regular and on-going program support and supervision by central office personnel
- Training to increase local school staff's understanding of and skill in implementing appropriate and effective early childhood programs

Accountability

- Annual school and school system evaluations of program appropriateness and program effectiveness in meeting state and/or locally identified goals
- Local school system participation in state-conducted evaluations of program impact

EEEP began in 1978 but was not implemented as a unified program until the following year. At that time, a teacher coordinator assigned to each school assisted with planning, implementation, and staff training. Today the teacher coordinator position is no longer supported by state dollars. State funds pay most teacher and aide salaries. Federal and local funds absorb additional personnel costs as well as expenses for transportation, materials, and supplies. The overall goal for EEEP remains the same. However, the prekindergarten program has been incorporated into *Schools for Success*, serving as a strategy for helping more children start first grade "ready to learn".

The commitment the State Superintendent, Joseph L. Shilling, the State Board of Education, Governor Schaefer, and the Maryland legislature have made to prekindergarten is demonstrated by its broad expansion, particularly within the last three years. In September 1979, EEEP prekindergartens operated in 33 schools in eight school systems throughout the state. In September 1990, the program was being implemented in 162 schools in 23 school systems statewide. In that eleven-year period, state funding for the program more than quadrupled.

METHOD

Subjects. This retrospective study was initiated when the second wave of prekindergarten graduates were in second grade. To achieve the research objectives, 17 schools that operated the program during the 1979-80 school year were selected using random proportional sampling methods. The 17 schools represented seven local school systems and were located in rural, suburban, and urban areas throughout the state. Within each school, prekindergarten and kindergarten class rolls were used to identify potential study participants. All children on the prekindergarten rolls were assigned to the treatment group if they had a 1975 birthdate, no known history of group experiences such as day care or Head Start, and if they had at-

tended kindergarten in the same school as prekindergarten. All children on the kindergarten rolls were assigned to the control group if they had a 1975 birthdate, no known history of group experiences, and had not been retained in kindergarten. Application of the criteria reduced an initial pool of 1,257 children to a sample size of 1,053. Five hundred seventy-seven children were in the treatment group and 476 in the control group.

At the time of the second follow-up in 1983, another criterion was applied: subjects' attendance in the school system in which they started school had to be continuous. This criterion continued to apply for all subsequent follow-ups. Table 1 provides information about sample sizes for each group at kindergarten, third, fifth, eighth, and ninth grades.

Table 1
Sample Sizes For the Prekindergarten and Non-Preschool Groups

Group	*Grade*				
	Kindergarten	*3*	*5*	*8*	*9*
Prekindergarten	416	356	353	326	326
Non-Preschool	476	301	286	272	271

At the outset, the prekindergarten and non-preschool groups differed on background characteristics found to correlate with initial school success but, in most cases, the differences were not statistically significant. Appendix A indicates that no significant differences were found between groups in ethnicity, age, gender, family composition, and fathers' educational level and occupational status. Numerical differences slightly favored the prekindergarten cohort. Significant differences were noted for mothers' educational level and occupational status. However, in both groups the typical mother was a high school drop-out, who, if working outside the home, was employed in various forms of skilled labor.

Data Collection. Data for the study was drawn from student records and collected by MSDE staff with assistance from local school system personnel. In addition to information about each child's academic history, demographic data was also gathered. This included parents' occupations and educational levels, presence or absence of both parents in the home, number of adults living in the home, and number of siblings. Information concerning each child's preschool experiences and the number of schools previously attended was recorded as a part of the academic history.

Occupational data was coded from 1 to 11 with persons not in the work force receiving a rank of 1 and laborers, for example, a rank of 2. Occupations were assigned to categories on the basis of their score on the Index of Occupational Status (Reiss, *Occupations and Social Status).* This particular scale was used as a reference because it takes both education and income into consideration. It thus provided some information not otherwise available.

The effect of prekindergarten participation was assessed using five outcome measures classified into two categories: school progress and academic achievement. The school progress category included three measures related to students' success in meeting the minimum requirements of one grade level and their readiness to move to the next. Used as evidence of unsatisfactory progress were risk status in kindergarten as determined by the Maryland Systematic Teacher Observation Instrument (MSTOI), retention, and as-

signment to special education on a full-time basis. Academic achievement was appraised using standardized test scores and Maryland Functional Test results. Basic skills achievement was compared using the reading comprehension, total language, and total mathematics subtests of the California Achievement Test (CAT) that is administered in the fall of third, fifth, and eighth grades to meet state accountability requirements.

The Maryland Functional Tests are minimum competency tests that assess students' basic knowledge in the areas of reading, writing, citizenship, and mathematics. Passing them is a requirement for high school graduation. Although most students take the tests in ninth grade, they may be taken or re-taken at any grade level 9-12. The reading and mathematics tests are administered by teachers in the fall. The writing test is given in winter and the citizenship test in spring. Comparisons in performance on the functional tests are reported in terms of the passing for students in each group who took them in ninth grade.

Students who had been retained or placed in special education classes were excluded from the California Achievement Test analyses. This is because the level of the achievement tests they took was different from the level they would have taken had they made normal progress through the grades. Comparing the achievement of retained third graders, who otherwise would have taken a fourth grade achievement test, to that of unretained third graders may have resulted in an inaccurate picture of the retained groups' actual achievement.

Group comparisons in performance on the California Achievement Test are reported using scale scores (S.S.) and grade equivalents (G.E.). Scale scores are three-digit numbers ranging from 000 to 999. They are useful in plotting trends and making comparisons across groups. Grade equivalents, like scale scores, also extend across grade levels. They represent the typical performance of the average student in an average school in a particular school year. For any particular grade equivalent score, 50 percent of students in the national norm sample are above this norm and 50 percent are below it.

Comparisons using grade level equivalents should be cautiously interpreted. The grade equivalents should not be viewed as an indication of the grade level at which a particular group is functioning. If, at third grade, the non-preschool group scores 5.0 on the reading comprehension subtest of the California Achievement Test, the only conclusion that can be drawn is that students in the non-preschool group thoroughly mastered reading comprehension skills taught in the first four grades. The 5.0 grade equivalent score does not mean that students the group are ready for fifth grade work. Furthermore, national norms merely represent the average score made by students in the standardization sample. Whether the performance of groups that are compared to the national norms is "good" or "bad" depends upon a number of factors such as the ability level of students in the comparison group and the opportunities they have had to learn what was tested.

Data Analysis. Since study participants had not been randomly assigned to the preschool and non-preschool groups, univariate analyses of variance were conducted to determine group equivalency on individual and demographic variables shown to be related to initial school performance. Based on the fact that differences between the groups were either not statistically significant or meaningful in real-life terms, dichotomous dependent measures including risk status in kindergarten, retention, special education placement, and passing rate on the Maryland Functional Tests were analyzed using tests of the difference between proportions. An analysis of variance, with prekindergarten participation and no preschool background as independent variables, was conducted to examine the two groups' mean performance on the California Achievement Test. Analysis of covariance was used to identify the magnitude of the prekinder-

garten and non-preschool groups' achievement gains from third to eighth grade. In the analysis, third grade reading comprehension, language, and mathematics test scores were used as covariates.

Study Limitations. This longitudinal study had three limitations. The first sample-related limitation was differential attrition. By third grade, 38 percent of the original prekindergarten participants and 36 percent of children in the preschool group were unavailable for follow-up study. By ninth grade, approximately 43 percent of the subjects in each group were no longer attending school in the system in which they had started. To put the attrition rate in perspective, in South Carolina State Department of Education's prekindergarten evaluation, the rate of attrition at first grade for the preschool group was 24 percent; for the non-preschool group it was 30 percent. In the Perry Preschool study, Weikart lost about 20 percent of his original 123 study participants by age 15.

Among participants in this study who were unavailable for follow-up, the majority had either moved out of state or transferred to a non-public school (Appendix B). Limitations imposed by confidentiality laws, geographical location, and differences in student assessment procedures made it impractical to collect data on such children. Omitting them from the study may have biased the results, but since nothing is known about them, no conclusion can be drawn about the direction of the bias.

Table 2

Attrition Rates for the Prekindergarten and Non-Preschool Groups Through Ninth Grade

Group	*Initial Sample Size*	*Rate of Attrition by Grade*									
		Kindergarten		3		5		8		9	
		N	%	N	%	N	%	N	%	N	%
Prekindergarten	577	416	27.9	356	38.3	353	38.8	326	43.5	326	43.5
Non-Preschool	476	476	--	306	35.7	286	39.9	272	42.9	271	43.1

Another sample-related limitation was differential enrollment. While participation in both prekindergarten and kindergarten in Maryland is voluntary, enrolling one's child in school *two* years earlier than required may have been indicative of some additional educational motivation on the part of the parent. If more of the children who participated in prekindergarten had parents who were more concerned about their children's educational attainments, then greater home support might have given the children an edge in terms of school success anyway. Differential enrollment could have biased the study in favor of finding an effect for the prekindergarten group.

According to Lazar (1989), IQ scores are not particularly good predictors of the school achievement of educationally disadvantaged children. According to Schweinhart and Weikart (1981), intelligence is the key to initial school success. Although the relationship between intelligence and early school performance is much debated, aptitude or ability is usually included as an independent variable in studies of educational effects. In this study, no data was available or could be obtained on children's entering abilities. Demographic variables, age, and sex of child were used to determine group equivalency instead.

RESULTS: PREKINDERGARTEN'S IMPACT ON LATER SCHOOL PERFORMANCE

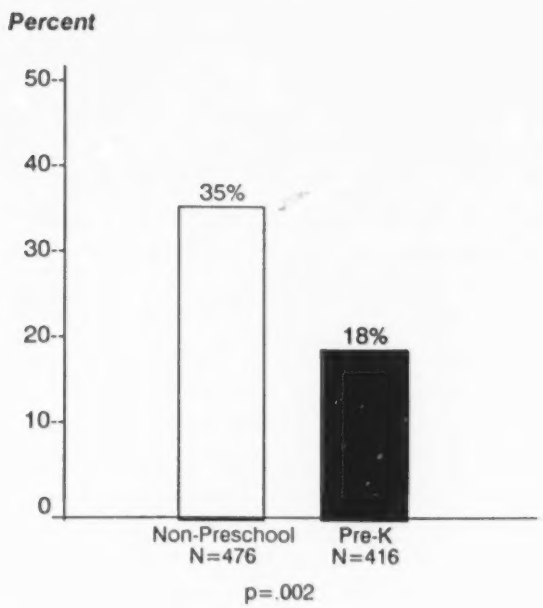
Question. In comparison to a similar group with no known preschool experience, what effect does prekindergarten have on participants' school performance through ninth grade?

School Progress: Risk Identification in Kindergarten

Each fall, public school kindergarten teachers in Maryland are required to screen their students for potential learning problems. In 1980, screening occurred through teacher observation using items on the Maryland Systematic Teacher Observation Instrument (MSTOI) as the basis. A cut-off score was applied to MSTOI results to identify children who may be at-risk for first grade learning difficulties. At-risk children received further assessment and, if necessary, interventions to ameliorate their problems. Figure 1 indicates that in fall 1981, 17 percent more children without preschool experiences than with prekindergarten backgrounds were identified as being at-risk. Prekindergarten apparently helped a significant number of its former participants acquire the personal, social, physical, and intellectual skills necessary to enter first grade ready to learn.

Figure 1

Percentage of Prekindergarten Graduates and Non-Preschool Children Identified as Being At-Risk in Kindergarten Fall 1980



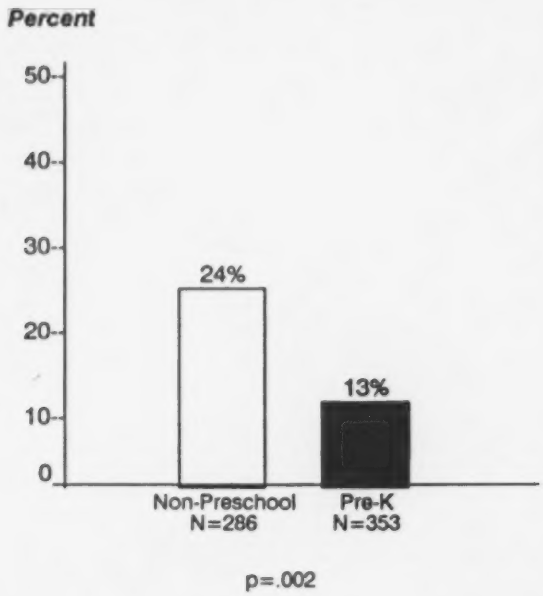
School Progress: Special Education Placements

Special education statistics only include those children who were placed in the program on a full time basis. The findings indicate that prekindergarten significantly reduced the number of children who were identified as being handicapped and placed in special education. Through fifth grade, only 13 percent of

prekindergarten graduates were identified as being handicapped and placed in special education. This compared to 24 percent of children without preschool backgrounds.

Figure 2

Percentage of Prekindergarten Graduates and Non-Preschool Children Assigned to Special Education Through Fifth Grade



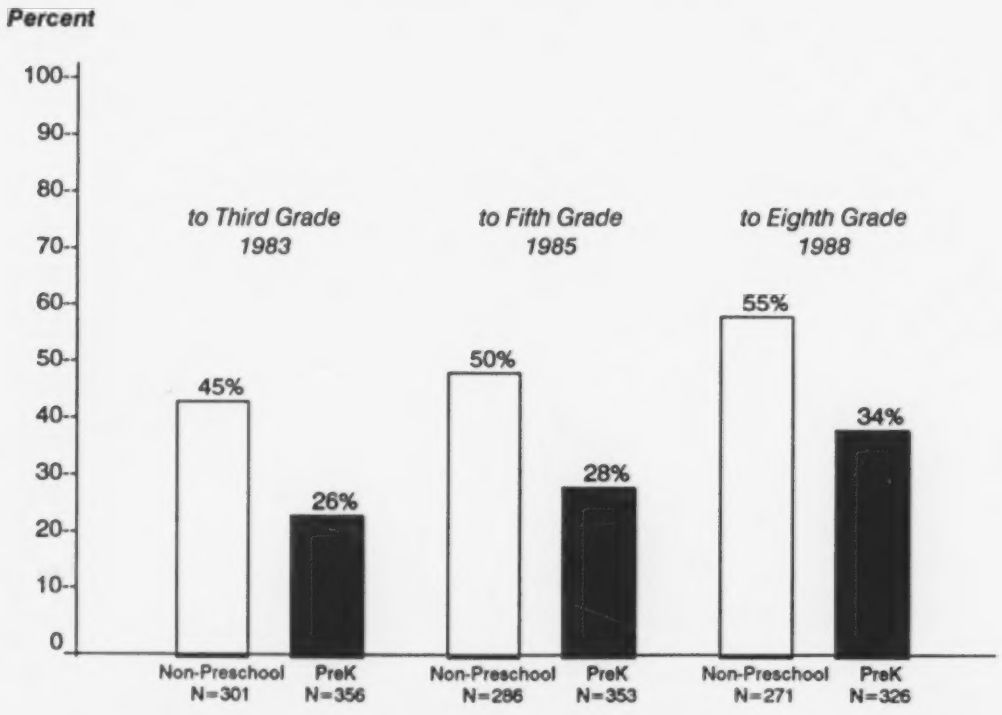
School Progress: Retention

The third measure of school progress used to evaluate prekindergarten program impact was the percentage of children in each group who had been retained in grade at least once during their school careers. The retention findings include children who were placed in special education subsequent to failing a grade or grades. Figure 3 shows that through the middle learning years prekindergarten significantly reduced the incidence of grade level failure. At third, fifth, and eighth grades, there was an average 20 percent difference in cumulative retention rates between the prekindergarten and non-preschool groups. For both the

prekindergarten and non-preschool groups the highest rate of retention occurred prior to third grade. In no instances could differences in the percentages of grade level failures be attributed to the effects of age or gender.

Figure 3

Cumulative Retention Rates for Prekindergarten Graduates and Non-Preschool Students at Third, Fifth, and Eighth Grades



Level of Significance p=.001

Academic Achievement: California Achievement Test Results

Tables 3-5 summarize the two groups' mean scale scores on the measures of academic achievement. In many cases, test score means are not based on the total number of third, fifth and eighth graders in each group, presumably because of their absence from school during the testing period. The data reveals differential achievement favoring the prekindergarten group in all cases. Prekindergarten graduates scored significantly higher than the non-preschool group on the reading comprehension, total language, and total mathematics subtests of the California Achievement Test at third, fifth and eighth grades. These findings indicate that the achievement effects of prekindergarten were long-term and persisted through the middle learning years.

California Achievement Tests:
Mean Scale Scores and Standard Deviations
for the Prekindergarten and Non-Preschool Groups

Table 3: Third Grade Results
Fall 1983

Group	Subtest Area								
	Reading Comprehension			Total Language			Total Mathematics		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Prekindergarten	260	397.92	50.47	256	428.68	56.51	260	369.64	35.23
Non-Preschool	163	380.08	45.78	164	404.08	51.51	163	355.52	28.42
Level of Significance		p=.006			p=.001			p=.02	

Table 4: Fifth Grade Results
Fall 1985

Group	Subtest Area								
	Reading Comprehension			Total Language			Total Mathematics		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Prekindergarten	214	488.28	52.89	213	520.23	52.37	214	464.35	39.97
Non-Preschool	119	468.02	51.10	119	500.61	53.88	118	447.30	37.22
Level of Significance		p=.001			p=.02			p=.01	

Table 5: Eighth Grade Results
Fall 1988

Group	Subtest Area								
	Reading Comprehension			Total Language			Total Mathematics		
	N	$\bar{X}$	SD	N	$\bar{X}$	SD	N	$\bar{X}$	SD
Prekindergarten	198	568.89	68.85	198	578.57	57.57	197	570.03	52.42
Non-Preschool	115	546.18	66.43	114	558.33	59.44	115	543.96	53.43
Level of Significance		p=.006			p=.003			p=.001	

Academic Achievement: Maryland Functional Test Results

Maryland Functional Test results were used as the second measure of academic achievement. On the average, approximately 42 percent of students in the prekindergarten group and 62 percent of students in the non-preschool group did not take the test. The majority had been retained and, thus, were not eligible to do so.

Table 6 shows that students in the prekindergarten group had a significantly higher passing rate on all four tests. Differences in the passing rate were greatest on the writing test where almost 15 percent more prekindergarten graduates passed. They were smallest on the reading test where only 5 percent more passed. The pattern of higher performance on the Maryland Functional Tests favoring prekindergarten is consistent with that found on the California Achievement Test. It suggests that more students with prekindergarten backgrounds than without preschool experiences have acquired the knowledge and skills needed to participate in a competitive job market and function as responsible citizens.

Table 6

Percentage of Prekindergarten Graduates and Non-Preschool Students Passing the Maryland Functional Tests in Ninth Grade 1989-1990

MD Functional Test	*Group*					
	Prekindergarten			*Non-Preschool*		
	No. Taking	*No. Passing*	*Passing Rate*	*No. Taking*	*No. Passing*	*Passing Rate*
Reading*	183	176	96.2	103	94	91.3
Mathematics*	190	132	69.5	99	58	58.6
Writing*	191	167	87.4	100	73	73.0
Citizenship*	189	149	78.8	97	66	68.0

**Group differences are all significant at p=.05.*

Question 2. Does prekindergarten participation improve economically disadvantaged children's performance to the extent that they achieve at a level comparable to that of children from a variety of socioeconomic backgrounds?

Using Achievement As the Criterion Measure

As the average prekindergarten graduate moved through elementary and middle school his or her performance pulled significantly ahead of that the average third grader in the California Achievement Test national norm sample. At third grade the prekindergarten group was one to two months below the national norm sample in reading comprehension and language arts, and only two months ahead of it in mathematics. By eighth grade, the average prekindergarten graduate was about a year ahead of the average eighth grader in the national norm sample in reading comprehension and language arts, and a half a year ahead in mathematics. If national norms on the Califonira Achievement Test are used as the measure of comparison, then the conclusion can be drawn that prekindergarten helps the average economically

disadvantaged children achieve at a level comparable to that of average children from a variety of socioeconomic backgrounds.

Table 7

Average Grade Equivalent Scores for the Prekindergarten Group In Comparison to the National Norm Sample and Statewide Averages

Group	Grade 3			Grade 5			Grade 8		
	Reading Comp.	*Total Language*	*Total Math*	*Reading Comp.*	*Total Language*	*Total Math*	*Reading Comp.*	*Total Language*	*Total Math*
Statewide Average	3.5	3.7	3.4	6.1	7.1	5.9	10.0	10.3	9.9
Prekindergarten	***3.1***	***3.3***	***3.3***	***5.8***	***6.6***	***5.7***	***9.2***	***9.6***	***9.1***
Non-Preschool	2.5	2.7	2.9	5.5	5.5	5.3	8.1	8.4	8.3
National Norm Sample	3.3	3.4	3.1	5.5	5.6	5.3	8.4	8.3	8.5

The picture is different if Maryland's average CAT scores are used as the measure of comparison. At third and fifth grades the prekindergarten group was four months below the statewide average in reading comprehension and language, and one month below in mathematics. At fifth grade the achievement gap remained about the same. By eighth grade, however, the average student in the prekindergarten group had lost ground. (S)he was performing approximately seven months below the average eighth grader in Maryland in all subtest areas. This difference is educationally significant. While prekindergarten helped improve disadvantaged children's performance to the extent that they demonstrated thorough mastery of the early and middle learning program curriculum, it had not yet improved their achievement to the point that it was comparable to that of students in Maryland from a variety of socioeconomic backgrounds.

Using Minimum Competency as the Criterion Measure

Ninth graders in the prekindergarten group exceeded the state passing rates on the Maryland Functional Tests in reading, mathematics, and citizenship. In writing, the passing rate for prekindergarten ninth graders and all ninth graders in the state was about the same. These findings show that economically

disadvantaged students with prekindergarten backgrounds were doing as well as all ninth graders in Maryland in meeting minimum academic competencies.

Table 8

Prekindergarten Graduates' Passing Rate on the Maryland Functional Tests In Comparison to Statewide Results

Maryland Functional Test	*Passing Rate*					
	Prekindergarten		*State*		*Non-Preschool*	
	Total N	*%*	*Total N*	*%*	*Total N*	*%*
Reading	183	**96.2**	46,129	93.4	103	91.3
Mathematics	190	**69.5**	47,608	67.9	99	58.6
Writing	191	**87.4**	47,026	88.4	100	73.0
Citizenship	189	**78.8**	39,436	75.0	97	68.0

Question 3. If prekindergarten leads to higher achievement, are the differential effects sustained over time? Does the achievement gap between the prekindergarten and non-preschool groups widen as they progress through school?

Table 9

Adjusted Mean Scale Scores on the California Achievement Test for the Prekindergarten and Non-Preschool Groups at Fifth and Eighth Grade

Group	*Grade 5*			*Grade 8*		
	Reading Comprehension	*Total Language*	*Total Mathematics*	*Reading Comprehension*	*Total Language*	*Total Mathematics*
Prekindergarten	483.38	515.41	460.60	563.97	573.36	565.12
Non-Preschool	475.89	510.74	455.24	556.12	567.40	551.52
Level of Significance	*p=.156*	*p=.299*	*p=.128*	*p=.271*	*p=.312*	*p=.016*

The magnitude of achievement gains over time was examined controlling for group differences in third grade achievement using scores on the reading comprehension, total language, and total mathematics subtests of the California Achievement Test. As Table 9 reveals, at fifth grade, there were no significant differences in achievement between the prekindergarten and non-preschool groups in any subtest area. At eighth grade, a significant difference was noted on the mathematics subtest only.

The findings disclose that in the area of language arts, any achievement benefits that prekindergarten bestowed were acquired prior to third grade. Beyond third grade, differences persisted but the achievement gap between prekindergarten graduates and non-preschool students didn't widen or attenuate. In mathematics, higher achievement at third grade ultimately led to greater achievement by grade 8. Differences between the prekindergarten and non-preschool groups widened over time.

One possible explanation for the findings is that language arts achievement is dependent upon knowledge and experience as well as the acquisition of skills. Many low-income students do not live in environments that offer them access to the broad base of experiences from which a breadth of knowledge derives. As they progress through school, therefore, their reading and language achievement tends to plateau. Mathematics skills, in contrast, can be taught in school. Achieving a strong foundation in basic operations in the early learning years may facilitate the learning of more complex mathematical processes later on in school.

DISCUSSION AND CONCLUSIONS

The EEEP prekindergarten longitudinal study is being conducted to examine the effects of early education on low-income children's later school performance. In this phase of the study, the effects of prekindergarten were traced from kindergarten through ninth grade. The overall findings show that prekindergarten participation sets in motion a linear path of effects and consequences that ultimately leads to improved academic performance through the beginning of high school. Whether higher academic performance results in a lower drop-out rate will be determined in the next few years.

The pattern of findings for EEEP prekindergartens adds to the existing body of research evidence that preschool that is institutionalized as part of public education can provide its participants with long-term achievement benefits. It thus challenges the notion that large-scale programs may not be able to replicate the outcomes to which the smaller, specially funded projects of the early and mid 1960s led. Striking and consistent results in this study suggest that regardless of the scope of provision, well-planned, carefully implemented, and closely supervised prekindergartens can reduce the incidence of adverse educational outcomes often associated with the conditions of poverty.

Like experimental preschool projects, public school prekindergarten can help keep participants from becoming sidetracked into extra grades, or alternative programs such as special education that can become dead-end tracks. Through the early learning years alone, EEEP prekindergarten participation reduced both grade level failure and special education placements by a little less than 50 percent. By keeping low-income children in the educational mainstream it increased their opportunities for dynamic interaction with other students who aspire to and realize success.

EEEP prekindergarten participation did more than just boost test scores temporarily as many studies have shown. As measured by the California Achievement Test, it had a significant long-term achievement effect that persisted through the middle learning years. The fact that at eighth grade, prekindergarten graduates were performing approximately ***one year*** ahead of their non-preschool counterparts is particularly surprising, considering that eight years had elapsed since their preschool experience.

The evidence suggests that public school prekindergarten has the potential to contribute to the realization of the goals in Schools For Success. At the beginning of school, prekindergarten seems to offset deficits in children's home environments that lead to cognitive, behavioral, or motivational deficiencies that interfere with their readiness to learn. In kindergarten, former prekindergarten participants were 50 percent less likely

than their non-preschool peers to be identified as being at-risk for learning problems. Prekindergarten's influence extends to the later years of school where it increases the probability that its graduates will meet minimum competency standards. At ninth grade, the passing rate of the prekindergarten group exceeded that of the state on the Maryland Functional Tests in reading, mathematics, and citizenship. Their passing rate on the functional writing test was about the same as that for the state.

Although prekindergarten weakens the link between economic disadvantage and lower school achievement it doesn't eliminate it entirely. From third to eighth grade the achievement gap between an average prekindergarten graduate and an average student in the state from any socioeconomic background widened. At eighth grade, prekindergarten graduates were seven months behind their more advantaged peers. While low-income students' achievement relative to higher income students' achievement may be viewed as a matter of secondary importance, the fact is that economically disadvantaged students will ultimately have to compete with all students in the state for fewer jobs. Having a comparable level of skills increases their chances of being considered for higher paying positions that can remove them from the cycle of intergenerational poverty or keep them from joining the ranks of the working poor.

Persistent achievement discrepancies between low and higher income students reminds us that no single intervention, alone, can inoculate economically disadvantaged children against failure. Prekindergarten should be provided as part of a well-coordinated comprehensive program that involves all agencies in preventing developmental delays, addressing health problems that interfere with learning, and improving family stability by upgrading the quality of life in high-risk social environments. Prekindergarten must also be part of a continuous progress program in which, at each level kindergarten through grade 12, instruction builds on what students already know and students are actively supported in learning as much as they can. Currently, learning is often duplicated from one grade to the next, grade level curricula place ceilings on learning, and over-reliance on teacher-centered methods limits learning to that which is taught through instruction.

In this study, prekindergarten and lack of early education had their greatest impact during the early childhood period. The majority of grade level failures occurred through fourth grade. Thereafter, the cumulative retention rate for each group only increased by about five percent. The basic direction of language arts achievement was established by third grade. From fourth through eighth grades the magnitude of each group's achievement gains remained relatively stable. Except in the area of mathematics, prekindergarten graduates didn't pull further ahead; nor did their non-preschool counterparts catch up.

Evidence of the critical importance of the early elementary grades in determining children's school success emphasizes the need for public and educational policies that attack failure from a developmental, rather than remedial, perspective. Policies such as increasing the availability of prekindergarten, requiring kindergarten attendance, targeting limited resources first of all to the primary grades, and restructuring education in the early years so that it is more compatible with young students' learning characteristics, can all decrease the probability that problems will occur. In the long run, such approaches may be more effective in preventing later failure since greater numbers of children will leave fourth grade with the self-esteem and academic competence required for success in middle school and beyond.

One of the reasons that may account for the efficacy of EEEP prekindergarten is that the program incorporated many of the elements of model programs that operated in the early and mid 1960s. Teachers were early childhood certified and received on-going training. Staff-child ratios were low, the programs were closely supervised by teacher coordinators, and prekindergarten was inextricably linked to kindergarten,

thereby smoothing the transition from one level of early childhood education to the next. In a sense, each prekindergarten operated as a model program.

In addition to being carefully controlled, the program in each school system had clearly defined goals and objectives and a carefully implemented curriculum. The curriculum specified a broad array of knowledge and skills that were fostered through a balance of deliberate teaching experiences and child-initiated activities. Many preschool programs err in being too open-ended or overly-directive. Lacking an appropriate balance between these two extremes may not be optimal for promoting later academic advantages. After all, the formula for successful learning beyond prekindergarten includes knowledge and skills, interest and inclination, and knowing how to learn.

Findings from this study indicating that public school prekindergarten can bestow benefits to its participants should be viewed with cautious optimism. Statewide results show positive effects for prekindergarten overall, but they don't provide information about its effectiveness on a school system-by-school system basis. In addition, the study had some methodological limitations which are inherent in any longitudinal research. The study lacked data on children's entering abilities. Sample attrition was 40 percent, not unusual for an eleven-year investigation. As the Consortium for Longitudinal Studies pointed out in *Lasting Effects After Preschool,* the loss of subjects over time is the most basic and common hazard of longitudinal research.

The highest rate of attrition for the prekindergarten group occurred immediately following prekindergarten, and for both groups, during the early childhood years. By fourth grade, over one-third of the children in each group had left the school systems where they had started school. Prekindergarten graduates and their non-preschool peers enrolled in non-public schools and moved out-of-district at about the same rate. Had they all remained in the study, the results may or may not have been different.

This quasi-experimental study of EEEP prekindergarten program effects corroborates findings from studies with more stringent research designs. It demonstrates that prekindergarten that is institutionalized as part of the public schools, by improving children's performance in the early elementary grades, prevents them from experiencing later academic difficulties that can have serious long-term consequences. Used as the basis for documenting the soundness of past policy decisions, study results demonstrate that tax dollars spent on education were a wise public investment. As the basis for future policy orientations, study results suggest that making prekindergarten available to more economically disadvantaged children would contribute to the attainment of the goals in *Schools For Success*.

APPENDIX A

Background Characteristics of the EEEP Prekindergarten and Non-Preschool Group at the Time of School Entry

Background Characteristic	*Group*		
	Prekindergarten N=577	*Non-Preschool N=476*	*Significance*[+]
Proportion Minority	.71	.74	N.S.
Proportion Male	.47	.51	N.S.
Proportion "Older"*	.70	.65	N.S.
Mother's Education (in years)	11.70	10.80	S.
Father's Education (in years)	11.90	11.40	N.S.
Mother's Occupational Status	3.00	2.30	S.
Father's Occupational Status	4.40	4.50	N.S.
Proportion of Households With:			
Both Parents in the Home	.53	.49	N.S.
A Non-Working Mother	.57	.59	N.S.
Number of Siblings	2.40	2.10	N.S.
Number of Persons in Household	4.80	4.60	N.S.

**Children born between January 1 and August 31, 1975.*

[+]N.S. means no significant differences were found between the prekindergarten and non-preschool groups. S means significant differences were found at the .05 level.

APPENDIX B

Attrition Statistics for the Prekindergarten and Non-Preschool Groups Through Ninth Grade

Group	*Initial N*	*Attrition*		*Causes*				
		N	*%*	*Non-Public School*	*Out-of-State*	*Out-of-District*	*Other*	*Unknown*
Prekindergarten	577	251	43.5	87	75	63	4	22
Non-Preschool	476	205	43.1	69	50	56	2	28

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